HALOS AND PRECIPITATION AT WAUSEON, OHIO.

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[Dated Weather Bureau, Columbus, Ohio, Nov. 16, 1914.]

A summary of the record of halos observed and with it the percentage of halos that were followed by precipitation within 24 hours has been furnished by Mr. Thomas Mikesell, cooperative observer at Wauseon, Ohio. For this report he has used the 40-year period from 1873 to 1912, inclusive. During those 40 years a total of 2,918 halos were observed, or an average of 73 per year. Of these, 2,219 were solar and 699 were lunar halos. The greatest number observed in any one year was 109 in 1899 and the least, 40, in 1880.

The number or halos observed by months was as follows:

Month.	Solar.	Lunar.	Total.
January	171	97	268
February	215	74	289
March	294	78	372
April	293	74	367
May	276	55	331
June	204	41	245
July	130	17	147
August	110	17	127
September	96	35	131
October	139	55	194
November	145	77	222
December	146	79	225

Studying this record in connection with storms it was found that 58 per cent of the solar halos and 59 per cent of the lunar halos were followed by precipitation within 24 hours.

Studying the record in connection with barometer readings and storms the following interesting relations were found:

Condition of barometer.	Number of halos observed.	Percentage of halos followed by precipitation within 24 hours.	Percentage of halos not followed by precipitation within 24 hours.
Above normal and rising	220	37	63
At about highest point	495	42	58
High but falling	893	64	36
About normal	572	58	42
Below normal and falling	334	83	17
Near the lowest point	205	66	34
Low but rising	199	53	47

By months the records shows the following relations:

Months.	Percentage of halos followed by precipitation within 24 hours.	Percentage of halos not followed by precipitation within 24 hours.
January	61	39
February	60	40
March	58	42
April	62	38
May	57	43
June	49	51
July	56	44
August	59	41
September	55	45
October	50	50
November	63	37
December	65	35

This record shows a greater frequency of halos in winter and spring than in summer and fall, and when the barometer is falling rather than when it is rising. With a low and falling barometer the chances for precipitation following the observance of a halo are in the ratio of 5 to 1, but with a high or rising barometer the probabilities are against precipitation within the following 24 hours.

Mr. Mikesell states that by extending the time limit to 30 hours the number of halos observed that were followed by precipitation was increased about 8 or 10 per cent.

LIGHT PILLARS AT BERNE, IND.

The Weather Bureau cooperative observer at Berne, Ind., Mr. H. M. Reusser, writes under date of December 18, 1914, as follows:

DEAR SIR: I wish to report an extraordinary phenomenon of the sun and our atmosphere this morning from a little before 7 a. m. to 7:30 a. m. I also send two poor drawings [omitted] of the same as seen in stages 1 and 2.

Before the sun rose we could see a bright reddish (not prismatic) streak nearly as wide as the sun's disk, extend straight up to about 20° to 25°, fading away and resembling the effects of a powerful searchlight at night. Soon, or exactly at 7 a. m. the sun rose as a dark red ball, and as it rose above the horizon the streak was separated from the sun about 1°. As the sun rose higher it passed behind a small cloud and at that time the streak extended below the sun to about 3°. Finally, about 7:30 a. m., the sun passed behind the clouds and the wonder was past. Everybody that saw it said that this was the first of its kind ever seen by them and many asked me what the cause might be.

It is evident that Mr. Reusser describes an occurrence of solar light pillars belonging to what Bravais has called "pillars of the first class" and also to what he calls "pillars of the second class." Light pillars are not notably rarer than the other phenomena of the family of halos and parhelia or "mock suns." All these appearances owe their presence to the reflection or refraction of the light rays by very fine floating ice crystals of one form or another. The light pillar results from reflections from flat, horizontal ice surfaces slowly falling through the air and pendulating as they descend. In many cases, as in the one reported by Mr. Reusser, the light pillars appear alone, unaccompanied by other halo phenomena. This leads one to conclude that the crystal forms able to produce the curved halo phenomena are here absent.

At present one is scarcely justified in saying more than the above regarding the causes of these light pillars. The following explanation of the phenomenon, extracted from the most modern general work on meteorological optics, will serve to show the general line of reasoning of most writers on the subject; but one of the fundamental assumptions therein demands modifications pointed out by Prof. Charles Hastings on page 619 below. It remains for our students of the forms of cloud-building ice crystals to discover, photograph, and determine the frequency of occurrence of crystal forms competent to produce these light pillars. Perhaps they have already been photographed among the many forms recorded by Mr. Bentley (Monthly Weather Review, Annual Summary, 1902, **30**: 607, Pl. 1–22) and by others—[C. A. jr.]

LIGHT PILLARS.

[*Extract from* "Meteorologische Optik" by PERTNER & EXNER.]

The phenomenon of light pillars is briefly referred to in the MONTHLY WEATHER REVIEW for July, 1914, page 443 and figure 1 on page 437. They may be described and explained as follows:[1]

Light pillars may be grouped into two well-defined classes: (1) Those that rest upon the horizon; (2) those

[1] Pernter, J. M. & Exner, Felix M., Meteorologische Optik. Wien, etc. 1902–10. 4°. pp. 397–399.